**BIO 100 – Student Learning Outcomes Assessment Team (SLOAT)**

**Spring 2011 Final Report**

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**Introduction**

BIO 100 is a beginning laboratory science class for students who plan to continue into medical, biological or related sciences. This course covers selected biology topics and introduces examples of physical science vocabulary and theory related to biological study.

The aim of BIO 100 is to provide a background for the student who has never studied biology in order to increase the chance of success in more advanced biology courses such as BIO 103 – 104, BIO 121 – 122, and BIO 211. It is notable that since BIO 100 is a foundations course, the material taught in this course is (or should be) designed to introduce new concepts, ideas, terminology etc. to students who have either no background in biology and are seeing it for the first time or for those who need a refresher (including returning, older or foreign students). This course also prepares students for chemistry, pharmacology and nursing requirements. Topics include the following: systems, tissues, inorganic and organic body chemistry, cells, cell membranes and cell respiration. Laboratory includes measuring instruments, microscopy and dissection techniques. While there are four course goals related to BIO 100, we decided to focus on the following two:

[Upon successful completion of this course, students should be able to do the following:]

Course Goal #1 – Explain terminology and fundamental concepts relevant to the structural organization of the human body, homeostasis and anatomical regions and cavities.

Course Goal #2 – Explain terminology and fundamental concepts relevant to basic chemistry and biochemistry including, but not limited to, matter and energy, atoms and elements, chemical bonds, chemical reactions and inorganic compounds.

**Purpose**

The purpose of this SLOAT study was to assess the level of student mastery of various course learning objectives related to the two BIO 100 course goals given above and to evaluate specific multiple-choice questions embedded in exams to determine their adequacy and BIO 100 level-appropriateness.

**Methodology**

For this assessment study, two sections of BIO 100 were chosen – sections 001 and 002. One section was taught by a full-time faculty member and the other an adjunct professor. A total of 41 students were given two exams described as follows: Exam 1: Homeostasis, Anatomical Terminology, Body Cavities, and Membranes – given in mid-February; and Exam 2: Chemistry – administered in mid-March.

We chose to embed our assessment questions on the exams that were standard for the course. Five assessment questions from each exam were blueprinted to course objectives and students were provided with ScanTron answer sheets (for these two exams only) to ease the process of data collection.

**Results**

The student learning outcomes data collected points out differences between the results of Exam 1 and Exam 2. (See BIO 100 – Appendix A.)

Exam 1 on Homeostasis, Anatomical Terminology etc. was administered by both a full-time and part-time instructor in their respective classes. The questions on Exam 1 covered the major topics in the Introduction Chapter of the text used for this course. Note that, traditionally, the first four chapters of the current Anatomy and Physiology text book is used in BIO 100 because it covers basic topics that are universal to both A&P I (BIO 121) and General Biology I (BIO 103).

The graph of student performance on the five assessment questions embedded in Exam 1 (see BIO 100 – Appendix B) reveals that, overall, students did not do very well on these questions. Based on these results, it is clear that many students did not meet BIO 100 Course Goal 1. In fact, students in both sections performed worst on Question #4, Which is not true concerning Positive Feedback? Specifically, student performance on this question was nearly the same result for both sections – the majority of students (over 90% in Section 001 and 85% in Section 002) answered incorrectly. In order to help students achieve MPO 1.4, explain how the body works cooperatively in order to maintain balance, which is related to Course Goal 1 and the learning objective that Question #4 was blueprinted to, it is important for instructors to give more relevant examples of the positive feedback mechanism and even to reinforce these examples by using visual aids and interactive software that should be incorporated into the PowerPoint presentation using during lectures. In addition, discussing case studies that illustrate the idea of the positive feedback mechanism would probably be beneficial to the student’s mastery of this concept. Lastly, it is suggested that practice exams should be included in the curriculum in order to enhance students’ grasps of the concepts presented in the course.

Student performance on assessment-embedded questions on Exam 2, which were blueprinted to the MPOs related to the second BIO 100 Course Goal (Chemistry), was much better than on Exam 1. In fact, most students did reasonably well on 4 of the 5 assessment questions, with the exception being Question #2, An organism’s mass is composed of 6 or 7 elements, what are they?, which 57% of the students in section 001 and 50% of the students in section 002 answered incorrectly,. This being said, the study of the structure of atoms (the basis of Question #2) *is* an important theme in that elements are considered building blocks for larger structures (molecules – micro and macro) and they are the composition of living systems. Additionally, the structure of atoms is one of the fundamental concepts alluded to in Course Goal 2. In order to help students achieve MPO 2.1, explain how the atomic theory is related to the properties of elements and how these properties determine the qualities seen in different elements, which is related to Course Goal 2 and the learning objective that Question #2 was blueprinted to, instructors should provide the student with hands on (practical) models so they can better understand and become proficient in chemical structure (chemical structure determines function). Virtual labs (software) would also be helpful to reinforce reactivity.

**Conclusion**

In examining the data, there are a number of conclusions that may be drawn from the results obtained in this assessment study of student learning outcomes. One such conclusion is that the difference in student performance results on Exams 1 and 2 could stem from either not enough emphasis being placed on the Introduction Chapter, *or* it may be simply due to the familiar situation in which the first exam of the semester is usually the most difficult for students since they are not familiar with the course (e.g., what topics are important to study, how to study biology, etc.) or with the testing style of the instructor. If the former reason given is the case, then instructors should emphasize the Introduction Chapter and encourage students to seriously study its content matter. On the other hand, if the latter reason given is the case, then better student performance results can be explained as follows: By the time the second exam is administered, students are more comfortable with the subject matter, their study habits may improve in response to the poor results achieved on Exam 1, and they are more familiar with the testing style of the professor.

BIO 100 is considered a “supplemental course” in that students who take Foundations of Biology are usually looking to advance to more difficult or rigorous courses such as Anatomy & Physiology, General Biology and other higher-level BIO courses. In order to prepare students for these challenging subjects, it is necessary that they be able to think critically about concepts in biology. By implementing in the course some of the suggestions mentioned above, students who pass BIO 100 successfully will be better prepared to compete with others in their field of study.

**BIO 100 – APPENDIX A**

**Exam 1 – Homeostasis, Anatomical Terminology, Body Cavities, and Membranes (Section 001) Results**

0

10

20

30

40

50

60

70

80

90

1

2

3

4

5

Exam Assessment Questions 1 **–** 5

Percent

incorrect

correct

**Exam 1 – Homeostasis, Anatomical Terminology, Body Cavities, and Membranes (Section 002 Results)**

0

10

20

30

40

50

60

70

80

90

100

1

2

3

4

5

Exam Assessment Questions 1 **–** 5

Percent

incorrect

correct

correct

incorrect

1

2

3

4

5

**Exam 2 – Chemistry (Section 001 Results)**

Percent

Exam Assessment Questions 1 – 5

90

80

70

60

50

40

30

20

10

0

**Exam 2 – Chemistry (Section 002 Results)**

0

20

40

60

80

100

120

1

2

3

4

5

Exam Assessment Questions 1 **–** 5

Percent

incorrect

correct

**BIO 100 – APPENDIX B**

**Exam 1 Questions: Homeostasis, Anatomical Terminology, Body Cavities, and Membranes**

1. The Right Lung is \_\_\_\_\_\_\_\_\_\_\_ to the Left Lung.

a. ipsilateral

b. contralateral

c. intermediate

d. deep

e. superficial Answer: b

2. The part of the Feedback System that continually monitors or receives information concerning

the body’s environment is called:

a. effector

b. receptor

c. control center

d. none of the above

e. all of the above Answer: b

3. The part of the Feedback System that receives information about the change and decides on the appropriate response is called:

a. effector

b. receptor

c. control center

d. none of the above

e. all of the above Answer: c

4. Which is not true concerning Positive Feedback?

a. usually occurs in special events

b. must be shut off by outside source

c. the stimulus is amplified

d. none are true

e. all are true Answer: e

5. The physiological range for blood pressure is:

a. 140/85

b. 110/50

c. 120/90

d. 120/80

e. none of the above Answer: d

**Exam 2 Questions: Chemistry**

1. What occupies space and has weight or mass?

a. gravity

b. matter

c. atmosphere

d. none of the above

e. all of the above Answer: b

2. An organism’s mass is composed of 6 or 7 elements, what are they?

a. CHONPS

b. CFeNOPS

c. CHNKPS

d. CHNaKPS

e. KHNOPS Answer: a

3. The smallest portion of an element that retains its chemical properties is called an:

a. proton

b. atom

c. electron

d. particle

e. none of the above Answer: b

4. Which particles have a positive charge?

a. electrons

b. protons

c. neutrons

d. both b and c

e. none of the above Answer: b

5. The atomic mass unit is the combined weight of:

a. electrons and neutrons

b. protons and electrons

c. protons and neutrons

d. all of the above

e. none of the above Answer: c